

**What is claimed is:**

1. An apparatus for detecting a type of an optical disc inserted into an optical disc system, the apparatus comprising:

5 an analog-to-digital converter that converts a focus error signal into an n-bit voltage data; and

a duty measurer that compares the n-bit voltage data with a positive noise voltage level and a negative noise voltage level, upcounts by a predetermined value if the n-bit voltage data is higher than the positive noise voltage level or lower than the negative voltage level, and outputs the upcounted result as a duty of the focus error signal.

2. The apparatus of claim 1, wherein the duty measurer comprises:

15 a comparing unit that generates an upcount signal if the n-bit voltage data is higher than the positive noise voltage level or lower than the negative voltage level and generates a hold signal if the n-bit voltage data is lower than the positive noise voltage level or higher than the negative voltage level; and

a counter that upcounts by a predetermined value in response to the upcount signal, holds a current count value in response to the hold signal, and outputs the upcounted result as the duty of the focus error signal.

3. The apparatus of claim 2, wherein the comparing unit comprises:

a buffer register that buffers the n-bit voltage data;

25 an absolute calculator that calculates an absolute value of the n-bit voltage data buffered by the buffer register; and

a comparator that compares the absolute value output from the absolute value calculator with the positive noise level, generates the upcount signal if the absolute value is greater than the positive noise voltage level, and generates the hold signal if the absolute value is less than the positive noise voltage level.

4. An apparatus for detecting a type of an optical disc inserted into an optical disc system, the apparatus comprising:

an analog-to-digital converter that converts a focus error signal into an n-bit voltage data; and

5 a reflected light amount measurer that compares current voltage data of the n-bit voltage data with previous voltage data of the n-bit voltage data, upcounts by a predetermined value if the current voltage data is more than a predetermined value different from the previous voltage data, and outputs the upcounted result as an amount of reflected light.

10 5. The apparatus of claim 4, wherein the reflected light amount measurer comprises:

a comparing unit that compares the current voltage data with the previous voltage data, generates an upcount signal if the current voltage data is more than the predetermined value different from the previous voltage data, and generates a hold

15 signal if the current voltage data is not different from the previous voltage data; and  
a counter that upcounts by a predetermined value in response to the upcount signal output from the comparing unit, holds a current count value in response to the hold signal, and outputs the upcounted result as the amount of reflected light.

20 6. The apparatus of claim 5, wherein the comparing unit comprises:

a first buffer register that buffers the n-bit voltage data output from the analog-to-digital converter as the current voltage data;

25 a second buffer register that buffers the n-bit voltage data output from the first buffer register as the previous voltage data; and

a comparator that compares upper m bits of the n-bit voltage data buffered by the first buffer register with upper m bits of the n-bit voltage data buffered by

the second buffer register, generates the hold signal if the upper m bits of the n-bit voltage data buffered by the first buffer register are equal to the upper m bits of the n-bit voltage data buffered by the second buffer register, and generates the upcount signal if the upper m bits of the n-bit voltage data buffered by the first buffer register are different from the upper m bits of the n-bit voltage data buffered by the second buffer register, wherein m is less than n.

7. A method of detecting a type of an optical disc inserted into an optical disc system, the method comprising:

detecting a focus error signal from the optical disc; and  
measuring a duty of the focus error signal by detecting a voltage of the focus error signal and detecting the type of the optical disc depending on the measured duty.

8. The method of claim 7, wherein the detection of the type of the optical disc comprises:

converting the focus error signal into n-bit voltage data;  
comparing the n-bit voltage data with a positive noise voltage level and a negative noise voltage level;  
upcounting by a predetermined value if the n-bit voltage data is higher than the positive noise voltage level or lower than the negative noise voltage level; and  
outputting the upcounted result as the duty of the focus error signal.

9. The method of claim 8, wherein the upcounting and outputting of the duty comprises:

generating the upcount signal if the n-bit voltage data is higher than the positive noise voltage level or lower than the negative noise voltage level and generating the hold signal if the n-bit voltage data is lower than the positive noise

voltage level or higher than the negative noise voltage level; and

upcounting by the predetermined value in response to the upcount signal, holds a current count value in response to the hold signal, and outputs the upcounted result as the duty of the focus error signal.

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10. The method of claim 9, wherein the generation of the upcount signal and the hold signal comprises:

calculating an absolute value of the n-bit voltage data; and

10 comparing the absolute value with the positive noise voltage level, generating the upcount signal if the absolute value is greater than the positive noise voltage level, and generating the hold signal if the absolute value is less than the positive noise voltage level.

11. A recording medium having instructions stored thereon for execution by a computer-executable program code to perform a method of detecting a type of an optical disc inserted into an optical disc system, the method comprising:

15 detecting a focus error signal from the optical disc; and measuring a duty of the focus error signal by detecting a voltage of the focus error signal and detecting the type of the optical disc depending on the measured duty.

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12. A method of detecting a type of an optical disc inserted into an optical disc system, the method comprising:

detecting a focus error signal from the optical disc; and

25 measuring an amount of reflected light of the focus error signal by detecting a voltage of the focus error signal and detecting the type of the optical disc depending on the measured amount of reflected light.

13. The method of claim 12, wherein the detection of the type of the optical disc comprises:

converting the focus error signal n-bit voltage data; and

5 comparing current voltage data of the n-bit voltage data with previous voltage data of the n-bit voltage data, upcounting or downcounting by a predetermined value if the current voltage data is more than a predetermined value different from the previous voltage data, and outputting the upcounted or downcounted result as the amount of reflected light.

10 14. The method of claim 13, wherein the upcounting and outputting of the amount of reflected light comprises:

15 comparing the current voltage data N of the n-bit voltage data with the previous voltage data of the n-bit voltage data, generating an upcount or downcount signal if the current voltage data is more than the predetermined value different from the previous voltage data, and generating a hold signal if the current voltage data is not different from the previous voltage data; and

upcounting or downcounting by the predetermined value in response to the upcount or downcount signal, holding a current count value in response to the hold signal, and outputting the counted result as the amount of reflected light.

20 15. The method of claim 14, wherein in the generation of the upcount or downcount signal and the hold signal, m bits of the current voltage data are compared with m bits of the previous voltage data, the hold signal is generated if the m bits of the current voltage data are equal to the m bits of the previous voltage data, and the upcount or  
25 downcount signal is generated if the m bits of the current voltage data are different from the m bits of the previous voltage data.

16. A recording medium having instructions stored thereon for execution by a computer-executable program code to perform a method of detecting a type of an optical disc inserted into an optical disc system, the method comprising:

detecting a focus error signal from the optical disc; and

measuring an amount of reflected light of the focus error signal by detecting a voltage of the focus error signal and detecting the type of the optical disc depending on the measured amount of reflected light.

17. An apparatus for adjusting a track balance in an optical disc system, the apparatus comprising:

an analog-to-digital converter that converts a tracking error signal into n-bit voltage data;

a duty measurer that compares the n-bit voltage data with a predetermined reference voltage, upcounts or downcounts by a predetermined value based on the comparison result, and outputs the counted result accumulated for a predetermined balance adjustment time as an unbalance value of the tracking error signal; and

a controller that compares the unbalance value with a predetermined allowable error and outputs a balance control signal to adjust a balance of the tracking error signal, if the unbalance value exceeds the predetermined allowable error.

18. The apparatus of claim 17, wherein the duty measurer comprises:

a buffer register that buffers the n-bit voltage data output from the analog-to-digital converter;

a comparator that compares the n-bit voltage data buffered by the buffer register with the predetermined reference voltage and generates an upcount signal if the n-bit voltage data is greater than the predetermined reference

voltage, and generates a downcount signal if the n-bit voltage data is less than the predetermined reference voltage; and

a counter that upcounts by a predetermined value in response to the upcount signal, downcounts by a predetermined value in response to the downcount signal, and  
5 outputs the counted result accumulated for the balance adjustment time as the unbalance value.

19. The apparatus of claim 18, wherein the comparator generates a hold  
10 signal if a frequency of the tracking error signal belongs to a predetermined low frequency domain, and the counter holds a current count value in response to the hold signal.

20. An apparatus for adjusting a track balance in an optical disc system by a detecting a voltage of a tracking error signal, the apparatus comprising:

15 an analog-to-digital converter that converts the tracking error signal into n-bit voltage data; and

a reflected light amount measurer that compares current voltage data of the n-bit voltage data and previous voltage data of the n-bit voltage data with a reference voltage, upcounts or downcounts by a predetermined value based on the comparison result, and  
20 outputs the counted result accumulated for a predetermined balance adjustment time as an unbalance value of the tracking error signal; and

a controller that compares the unbalance value with a predetermined allowable error and outputs a balance control signal to adjust a balance of the tracking error signal if the unbalance value exceeds the predetermined allowable error.

21. The apparatus of claim 20, wherein the reflected light amount measurer comprises:

a comparing unit that compares the current voltage data with the previous voltage data, compares the current voltage data and the previous voltage data with a reference voltage if a predetermined voltage difference occurs between the current voltage data and the previous voltage data, and generates an upcount signal, a downcount signal, or a hold signal based on the comparison result; and

a counter that upcounts by a predetermined value in response to the upcount signal, downcounts by a predetermined value in response to the downcount signal, or holds a current count value in response to the hold signal, and outputs the counted value accumulated for the predetermined balance adjustment time as the unbalance value.

22. The apparatus of claim 21, wherein the comparing unit generates the hold signal if the tracking error signal belongs to a predetermined low frequency domain.

23. The apparatus of claim 21, wherein the comparing unit comprises:

a first buffer register that buffers the n-bit voltage data output from the analog-to-digital converter as the current voltage data;

a second buffer register that buffers the n-bit voltage data output from the first buffer register as the previous voltage data; and

a comparator that compares the current voltage data with the previous voltage data, compares the current voltage data and the previous voltage data with the reference voltage if the predetermined voltage difference occurs between the current voltage data and the previous voltage data, generates the upcount signal if the current voltage data and the previous voltage data are



higher than the reference voltage, generates the downcount signal if the current voltage data and the previous voltage data are lower than the reference voltage, and generates the hold signal if only one of the current voltage data and the previous voltage data is higher or lower than the reference voltage.

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24. The apparatus of claim 23, wherein the comparator generates the hold signal if the tracking error signal belongs to the predetermined low frequency domain.

25. A method of adjusting a track balance in an optical disc system, the  
10 method comprising:  
detecting a tracking error signal from an optical disc inserted into the optical disc system;  
detecting a voltage of the tracking error signal and measuring a duty of the tracking error signal with respect to a predetermined reference voltage as an unbalance  
15 value for a predetermined balance adjustment time; and  
comparing the unbalance value with a predetermined allowable error and generating a balance control signal to adjust a balance of the tracking error signal if the unbalance value exceeds the predetermined allowable error.

20 26. The method of claim 25, wherein the measuring of the unbalance value comprises:

converting the tracking error signal into n-bit voltage data; and  
comparing the n-bit voltage data with the reference voltage, upcounts or  
downcounts by a predetermined value for the predetermined balance adjustment time  
25 based on the comparison result and outputting the counted result accumulated for the predetermined balance adjustment time as the unbalance value.

27. The method of claim 26, wherein the outputting of the unbalance value comprises:

comparing the n-bit voltage data with the reference voltage, generating an upcount signal if the n-bit voltage data is greater than the reference voltage, and  
5 generating a downcount signal if the n-bit voltage data is less than the reference voltage; and

upcounting by a predetermined value for the balance adjustment time in response to the upcount signal, downcounting by a predetermined value in response to the downcount signal, and outputting the counted result accumulated for the balance  
10 adjustment time as the unbalance value.

28. The method of claim 27, further comprising:

generating a hold signal if a frequency of the tracking error signal belongs to a predetermined low frequency domain; and

15 holding a current count value in response to the hold signal.

29. A recording medium having instructions stored thereon for execution by a computer-executable program code to perform a method of adjusting a track balance in an optical disc system, the method comprising:

20 detecting a tracking error signal from an optical disc inserted into the optical disc system;

detecting a voltage of the tracking error signal and measuring a duty of the tracking error signal with respect to a predetermined reference voltage as an unbalance value for a predetermined balance adjustment time; and

25 comparing the unbalance value with a predetermined allowable error and generating a balance control signal to adjust a balance of the tracking error signal if the unbalance value exceeds the predetermined allowable error.

30. A method of adjusting a track balance in an optical disc system, the method comprising:

detecting a tracking error signal from an optical disc inserted into the optical disc system;

5 detecting a voltage of the tracking error signal and measuring an amount of reflected light of the tracking error signal with respect to a predetermined reference voltage as an unbalance value of the tracking error signal for a predetermined balance adjustment time; and

10 comparing the unbalance value with a predetermined allowable error and generating a balance control signal to adjust a balance of the tracking error signal if the unbalance value exceeds the predetermined allowable error.

31. The method of claim 30, wherein the outputting of the unbalance value comprises:

15 converting the tracking error signal into n-bit voltage data; and comparing current voltage data of the n-bit voltage data and previous voltage data of the n-bit voltage data with a reference voltage, upcounting or downcounting by a predetermined value for the balance adjustment time, and outputting the counted result accumulated for the balance adjustment time as the unbalance value.

20 32. The method of claim 31, wherein the outputting of the unbalance value comprises:

25 comparing the current voltage data and the previous voltage data with the reference voltage if a predetermined voltage difference occurs between the current voltage data and the previous voltage data;

generating an upcount signal if the current voltage data and the previous voltage data are higher than the reference voltage;

generating a downcount signal if the current voltage data and the previous voltage data are lower than the reference voltage;

generating the hold signal if only one of the current voltage data and the previous voltage data is higher or lower than the reference voltage;

5        upcounting by a predetermined value for the balance adjustment time in response to the upcount signal, downcounts by a predetermined value in response to the downcount signal, and holding a current count value in response to the hold signal; and  
      outputting the counted result accumulated for the balance adjustment time as the unbalance value.

10        33.    The method of claim 32, further comprising:

      generating the hold signal if a frequency of the tracking error signal belongs to a predetermined low frequency domain.

15        34.    A recording medium having instructions stored thereon for execution by a computer-executable program code to perform a method of adjusting a track balance in an optical disc system, comprising:

      detecting a tracking error signal from an optical disc inserted into the optical disc system;

20        detecting a voltage of the tracking error signal and measuring an amount of reflected light of the tracking error signal with respect to a predetermined reference voltage as an unbalance value of the tracking error signal for a predetermined balance adjustment time; and

      comparing the unbalance value with a predetermined allowable error and  
25        generating a balance control signal to adjust a balance of the tracking error signal if the unbalance value exceeds the predetermined allowable error.